

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
2 December 2004 (02.12.2004)

PCT

(10) International Publication Number  
**WO 2004/104072 A3**

(51) International Patent Classification<sup>7</sup>: **B29C 44/02**,  
51/02, C08J 9/00

FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,  
SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

(21) International Application Number:  
PCT/US2004/015245

(22) International Filing Date: 14 May 2004 (14.05.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/471,477 17 May 2003 (17.05.2003) US

(71) Applicant (for all designated States except US): **MICRO-  
GREEN POLYMERS, INC.** [US/US]; 8316 272nd Street  
N.W., Stanwood, WA 98292 (US).

(71) Applicants and

(72) Inventors: **BRANCH, Gregory, L.** [US/US]; 8316 272nd  
Street N.W., Stanwood, WA 98292 (US). **WARDLE,  
Trevor** [CA/US]; 4905 Robinhood Drive, Ashland, KY  
41101 (US).

(74) Agent: **CLAIBORNE, Anthony**; Claiborne Patent Law  
Services, 849 136th Ave. N.E., Bellevue, WA 98005 (US).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,  
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,  
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,  
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,  
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,  
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,  
ZW.

(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

**Declarations under Rule 4.17:**

— as to the identity of the inventor (Rule 4.17(i)) for the fol-  
lowing designations AE, AG, AL, AM, AT, AU, AZ, BA, BB,  
BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE,  
DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM,  
HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK,  
LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,  
NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE,  
SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC,  
VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE,  
LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian  
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European  
patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,  
GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK,  
TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG)

— as to applicant's entitlement to apply for and be granted  
a patent (Rule 4.17(ii)) for the following designations AE,  
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ,  
CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE,  
EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS,  
JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA,  
MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM,  
PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ,  
TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM,  
ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA,  
SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ,  
BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE,  
BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE,  
IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent  
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE,  
SN, TD, TG)

— of inventorship (Rule 4.17(iv)) for US only

**Published:**

— with international search report  
— before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

(88) Date of publication of the international search report:  
24 February 2005

[Continued on next page]

(54) Title: MANUFACTURE OF FULLY RECYCLABLE FOAMED POLYMER FROM RECYCLED MATERIAL

(57) Abstract: A solid state foaming process permits the use of up to 100 % recycled pre- and post-consumer polymer for the manufacture of foamed polymer material and thermoformed foamed polymer articles. The process enables the optional formation of integral unfoamed skins of controllable depth and crystallinity on foamed polymeric materials suitable for a wide variety of applications. Because this process does not alter the underlying chemistry of the material all scrap from the manufacturing process may be reused without additive to form new foamed polymeric materials and articles.

WO 2004/104072 A3



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/15245

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : B29C 44/02, 51/02, C08J 9/00

US CL : 264/50, 320, 321, 544; 521/51, 182, 79, 146, 180

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 264/50, 320, 321, 544; 521/51

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
EAST database; ket words; interleaving, foams, recycled, PET, gas channelling.

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,684,055 A (KUMAR et al) 4 November 1997, column 4, line 42 to column 5, line 36, illustrative examples.	1-11

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

05 December 2004 (05.12.2004)

Date of mailing of the international search report

20 DEC 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

Irina S. Zemel

Telephone No. 571-272-0577

*J. Whitfield*  
For